

Indiana Cervical Cancer Strategic Plan

2019-2028



Primary Prevention



Early Detection



Treatment



Survivorship



Indiana State
Department of Health

Table of Contents

Acknowledgements.....	Page 2
Endorsement Letter.....	Page 5
Executive Summary.....	Page 7
Cervical Cancer.....	Page 7
Human Papillomavirus.....	Page 7
Screening.....	Page 9
Additional Risk Factors.....	Page 9
Summary of Goals and Objectives.....	Page 10
House Enrolled Act No. 1278.....	Page 11
Plan Framework and How it Aligns with State Cancer Control Plan.....	Page 13
Goals.....	Page 13
Objectives.....	Page 13
Strategies.....	Page 13
Measures.....	Page 13
Process and Key Collaborators.....	Page 14
Burden of Cervical Cancer in Indiana.....	Page 15
Incidence and Mortality.....	Page 15
Survival and Staging.....	Page 16
Costs of Cervical Cancer.....	Page 17
Health Equity.....	Page 18
Primary Prevention.....	Page 22
Early Detection.....	Page 29
Treatment.....	Page 33
Survivorship.....	Page 38
Appendices.....	Page 41

This publication was supported by grant number, **NU58DP006319**, funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

Acknowledgements

Lead Content Editors

Megan Agnew – Cancer Policy and Communications Director, Cancer Control Section
Keylee Wright – Director, Cancer Control Section

Indiana State Department of Health Internal Work Group

Megan Agnew – Cancer Control Section
Martha Allen – Maternal and Child Health Division
Ann Alley – Division of Chronic Disease, Primary Care, and Rural Health
Melissa Cervantes – Cancer Early Detection Section
Lauren Clark – Immunization Division*
Melissa Collier – Chief Medical Officer
Caitlin Conrad – HIV, STD, and Viral Hepatitis Division
Themen Danielson – Health and Human Services Commission*
Joan Duwve – Chief Medical Officer*
Alicia Earnest – Epidemiology Resource Center
Trent Fox – Chief of Staff
Mugdha Golwalkar – Epidemiology Resource Center*
Antoniette Holt – Office of Health Disparities and Minority Wellness
Geena Lawrence – Maternal and Child Health Division*
Terri Lee – Office of Women’s Health
Reiss Leuken – Immunization Division*
Art Logsdon – Health and Human Services Commission*
Dave McCormick – Immunization Division
Olivia Ridgeway – HIV, STD, and Viral Hepatitis Division
Amanda Raftery – Cancer Surveillance Section*
Katelin Rupp – Tobacco Prevention and Cessation Commission
Laura Ruppert – Cancer Surveillance Section*
Michael Ryan – HIV, STD, and Viral Hepatitis Division*
Heather Sager – Cancer Control Section*
Claudine Samanic – CDC Epidemiology Assignee
Angela Shamblin – Epidemiology Resource Center
Caylie Simon – Cancer Surveillance Section
Dennine Smith – Maternal and Child Health Division
Miranda Spitznagle – Tobacco Prevention and Cessation Commission
Linda Stemnock – Epidemiology Resource Center*
Dennis Stover – HIV, STD, and Viral Hepatitis Division
Eldon Whetstone – Health and Human Services Commission
Keylee Wright – Cancer Control Section
Natasha Young – Cancer Control Section

*Former roles with the Indiana State Department of Health

Collaborative Partners

Melanie Atwood – Gilda’s Club Evansville
Jane Berby-Todd – St. Vincent Cancer Care

Sarah Bosslet – Witham Health Services, Indiana Chapter of the American Academy of Pediatrics
Kaila Brooks – North Central Nursing Clinics—Purdue University
S. Andrew Bullock – Harper Cancer Research Institute at the University of Notre Dame
Cynthia Burkhardt – Hoosier Cancer Research Network
Michael Callahan – St. Vincent Gynecologic Oncology
Rishika Chauhan – Indiana Cancer Consortium
Katherine Crawford – American Cancer Society
Cynthia Cunningham – Community Solutions, Inc.
Randy Dillinger – Hoosier Cancer Research Network
Deena Dodd – Indiana Rural Health Association
Julia Engrstrom-Melnyk – Roche Diagnostics Corporation
Brenda and Kirk Forbes – Kristen Forbes EVE Foundation
Erica Frazier Stum – Cervivor
Chad Galer – IU School of Medicine, American College of Surgeons Commission on Cancer
Tony Gillespie – Indiana Minority Health Coalition
Sarah Goodrich – St. Vincent Gynecologic Oncology
Paul Halverson – IU Richard M. Fairbanks School of Public Health
Jiali Han – IU Richard M. Fairbanks School of Public Health
Bryan Hannon – American Cancer Society Cancer Action Network
Kim Hay – Spencer County Health Department
Helen Jess – Community Solutions, Inc.
Julie Langston – North Central Nursing Clinics—Purdue University
Cynthia Lewis – Cynthia K Lewis & Associates, LLC
Pat Loehrer – Indiana University Melvin and Bren Simon Cancer Center
Kaley Martin – Community Solutions, Inc.
Paige McDaniel – Indiana State Nurses Association
Blayne Miley – Indiana State Nurses Association
Beth Meyerson – IU School of Public Health-Bloomington, Cervical Cancer-Free Coalition
Rep. Sharon Negele – Indiana House of Representatives
Lisa Osterman – Community Solutions, Inc.
Litany Pyle – Indiana House of Representatives
Timothy Ratliff – Purdue University Center for Cancer Research
Cynthia Robbins – Indiana American Academy of Pediatrics, Eskenazi Health Teen Care and Wellness Program, IU School of Medicine
Lisa Robertson – Indiana Immunization Coalition
Jeanne Schilder – Indiana University School of Medicine
Julie Schnieders – St. Vincent Carmel Women’s Center
Rivienne Shedd-Steele – Indiana University School of Medicine, IU Simon Cancer Center
Heidi Stan – Indiana Association for Health, Physical Education, Recreation and Dance, Hamilton Southeastern Schools
Sarah Strawbridge – Merck/US Policy and Government Relations
Yecenia Tostado – Indiana Latino Institute
Brownsyne Tucker Edmonds – IU School of Medicine, Indiana Chapter of the American Congress of Obstetricians and Gynecologists
Jeanne Van Tyle – Butler University

Stephanie Vanderhorst – Indiana Auburn Birthing Center
Jennifer Walthall – Family and Social Services Administration
Cathy Whaley – Northeast Area Health Education Centers
Gregory Zimet – IU School of Medicine
Terrell Zollinger – Cynthia K Lewis & Associates, LLC

Endorsement Letter

Dear Hoosiers,

In 2017, the Indiana General Assembly recognized an opportunity to collaborate on a statewide level. Despite the fact that cervical cancer is almost completely preventable, nationally, in 2018, 13,240 cases of cervical cancer are expected to be diagnosed and 4,170 deaths are likely to occur due to cervical cancer. In Indiana, approximately 264 new cases of cervical cancer and 88 cervical cancer-related deaths occur annually.

Developed by a statewide working group consisting of government agencies, educational institutions, medical providers, advocates, and survivors, the Indiana Cervical Cancer Strategic Plan is a 10-year plan intended to serve as a comprehensive roadmap to address the burden of cervical cancer in Indiana. The plan consists of four focus areas: primary prevention, early detection, treatment, and survivorship. Each section includes SMART (Specific, Measurable, Attainable, Relevant, and Time-phased) objectives, with strategies to achieve set targets.

This plan is for everyone in our state who is invested in the goal of eliminating cervical cancer in Indiana. As our state moves forward in adopting and implementing this plan, we ask that every person take an active role by:

- Reading this plan to keep informed about cervical cancer and how it affects Indiana
- Leading a healthy lifestyle and reducing individual risk for cervical cancer through regular screening, avoidance of controllable risk factors, and vaccination against the human papillomavirus (HPV)
- Informing and educating family, friends, neighbors, and co-workers and encouraging them to be proactive about cervical cancer prevention, vaccination, and screening
- Implementing the plan's strategies within your sphere of influence, such as home, school, and work.

As we take steps as individuals and organizations, our state makes progress toward eliminating cervical cancer. Cervical cancer is nearly 100 percent preventable, so let's work to ensure that not one more life is lost to it.

Yours in health,



Kristina Box, MD, FACOG
State Health Commissioner
Indiana State Department of Health



Jennifer Walthall, MD, MPH
Secretary
Indiana Family and Social Services
Administration



Patrick J. Loehrer, Sr., MD
Indiana University Distinguished Professor
H.H. Gregg Professor of Oncology
Director, Indiana University Melvin and Bren
Simon Cancer Center
Associate Dean for Cancer Research
Indiana University School of Medicine



Timothy L. Ratliff, PhD
Distinguished Professor
Comparative Pathobiology
Robert Wallace Miller Director
Purdue University Center for Cancer
Research



Sharon Negele
State Representative
District 13

Executive Summary

The Indiana State Department of Health (ISDH) acknowledges and thanks the Indiana General Assembly for passing House Enrolled Act No. 1278, which was signed into law by Gov. Eric Holcomb on April 10, 2017. The law requires ISDH to develop a strategic plan to identify and significantly reduce morbidity and mortality from cervical cancer, and to collaborate with the Indiana Family and Social Services Administration and certain cancer facilities. It also allows the department to establish workgroups; establishes requirements for the department in developing the strategic plan; and requires that a report on the strategic plan and recommendations on goal implementation and schedule compliance be delivered to the Governor and legislature before December 31, 2018.

Cervical Cancer

Cervical cancer is cancer of the cervix, which is the lower, narrow end of the uterus, and leads from the uterus to the vagina. The main types of cervical cancer are squamous cell carcinoma and adenocarcinoma. Squamous cell carcinoma begins in the thin, flat cells that line the cervix and is the most common type of cervical cancer, accounting for up to 90 percent of cases.¹ Adenocarcinoma begins in the cervical cells that produce mucus and other fluids, and make up the majority of other cervical cancer cases.¹ Other types of cancer also can develop in the cervix. One of the most important things to know about cervical cancer is that it is nearly 100 percent preventable through vaccination against the human papillomavirus (HPV), regular screening, and avoiding risk factors.

HPV

HPV is a group of more than 150 related viruses. Each HPV virus in this large group is given a number, which is called its HPV type. HPV is named for the warts (papillomas) some HPV types can cause. Some other HPV types can lead to cancer. HPV cancers include cancer of the cervix, vulva, vagina, penis, or anus. HPV infection can also cause cancer in the back of the throat, including the base of the tongue and tonsils.

HPV is a very common virus; nearly 80 million people—about one in four—are currently infected in the United States. About 14 million people, including teens, become infected with HPV each year. Most people with HPV never develop symptoms or health problems. Most HPV infections (nine out of 10) go away by themselves within two years. But, sometimes, HPV infections will last longer, and can cause certain cancers and other diseases.

Infection with HPV is the single greatest risk factor for cervical cancer, but the HPV vaccine is an effective tool to prevent infection. HPV is very common, but in Indiana, only 48.4% of females and 33.5% of males aged 13 – 17 were considered up to date² on their HPV vaccine in 2017, according to the Centers for Disease Control and Prevention (CDC). The CDC

¹ American Cancer Society. What is Cervical Cancer? [Webpage](#). Accessed on 10/25/2018.

² [Up-to-date \(UTD\)](#): HPV UTD includes those with ≥3 doses, and those with 2 doses when the first HPV vaccine dose was initiated before age 15 years and time between the first and second dose was at least 5 months minus 4 days.

recommends that HPV vaccination begin at age 11 or 12 years for both boys and girls; however, the vaccine can be administered through age 26, and can be started as early as 9 years of age.

Research has shown that HPV vaccines provide nearly 100% protection against cervical precancers and genital warts. Since the first HPV vaccine was recommended in 2006, there has been a 64% reduction in vaccine-type HPV infections among teen girls in the United States. Studies have shown that fewer teens are getting genital warts and cervical precancers are decreasing.³

Years of testing are required by law to ensure the safety of vaccines before they are made available for use in the United States. Once a vaccine is in use, the CDC and Food and Drug Administration (FDA) monitor any associated side effects or possible side effects (adverse events) through the Vaccine Adverse Event Reporting System and other vaccine safety systems.³

All three HPV vaccines—Cervarix[®], Gardasil[®], and Gardasil[®] 9—went through years of extensive safety testing before they were licensed by the FDA. Cervarix[®] was studied in clinical trials with more than 30,000 females. Gardasil[®] trials included more than 29,000 females and males, and Gardasil[®] 9 trials included more than 15,000 females and males. No serious safety concerns were identified in these clinical trials. The FDA only licenses a vaccine if it is safe, effective, and the benefits outweigh the risks. The CDC and FDA continue to monitor HPV vaccines to make sure they are safe and beneficial for the public.³ As of 2017, Gardasil[®] 9 is the only HPV vaccine available in the United States.⁴

In October 2018, the FDA expanded the use of Gardasil[®] 9 to include men and women age 27 through 45.⁵ In a study of approximately 3,200 women age 27 through 45, Gardasil was 88 percent effective in the prevention of persistent infection, genital warts, vulvar and vaginal precancerous lesions, cervical precancerous lesions, and cervical cancer related to HPV types covered by the vaccine.⁵ Due to results from this study and others, the FDA has decided to expand the age range to include men and women who were not previously vaccinated. However, it should be noted that the approval by the FDA is not the same as a recommendation from the Advisory Committee on Immunization Practices (ACIP).⁶ The ACIP provides advice and guidance to the director of the CDC regarding use of vaccines and related agents for control of vaccine-preventable diseases in the civilian population of the United States. Recommendations made by the ACIP are reviewed by the CDC director and, if adopted, are published as official CDC/U.S. Health and Human Services recommendations in the Morbidity and Mortality Weekly Report. The ACIP is still reviewing the evidence to determine whether or not to expand the HPV vaccination recommendation.⁶

³ Centers for Disease Control and Prevention. What is HPV? Questions & Answers. [Webpage](#). Accessed on 2/27/2018.

⁴ American Cancer Society. HPV Vaccines. [Webpage](#). Accessed on 10/31/18.

⁵ U.S. Food and Drug Administration. FDA approves expanded use of Gardasil 9 to include individuals 27 through 45 years old. [News release](#). Accessed on 10/22/18.

⁶ National HPV Vaccination Roundtable. HPV Roundtable Update: FDA approval of Gardasil 9 to age 45. [Webinar](#). Accessed on 10/31/2018.

Screening

According to the American Cancer Society (ACS), early detection of cancer or precancerous changes of the cervix through screening reduces mortality from cancer of the uterine cervix. Screening refers to testing individuals who are asymptomatic for a disease (they have no symptoms that indicate presence of disease). In addition to detecting cancer early, screening for cervical cancer can prevent the disease altogether by identifying precancerous lesions that can be removed. Detecting cancer at an early stage or precancerous stage can increase survival rates and reduce treatment complications.

Two types of cervical cancer screening tests exist – Pap smear cytology screenings and HPV screenings. Pap screenings, or Pap smears, allow for early identification and treatment of abnormal cervical cells before they become cancerous. The Pap smear looks for cell changes on the cervix that might become cancerous if they are not treated appropriately. This is important because, typically, precancerous conditions do not cause pain or other symptoms and are only detected through a Pap smear. HPV screening, or the HPV test, looks for the virus that can cause cervical cell changes.

The United States Preventive Services Task Force (USPSTF) currently recommends screening for cervical cancer every three years with cervical cytology alone in women age 21 to 29 years. For women age 30 to 65 years, the USPSTF recommends screening every three years with cervical cytology alone, every five years with high-risk human papillomavirus (hrHPV) testing alone, or every five years with hrHPV testing in combination with cytology (cotesting).

Additional Risk Factors

According to the CDC, other things can increase risk for cervical cancer:

- Smoking;
- Having the human immunodeficiency virus (HIV; the virus that causes AIDS) or another condition that makes it hard for your body to fight off health problems;
- Using birth control pills for a long time (five or more years);
- Having given birth to three or more children; and
- Having several sexual partners.

According to the ACS, women who smoke are twice as likely to get cervical cancer as nonsmokers. In addition, women who smoke are more likely to be infected with a high-risk HPV infection.⁷ Further, for a woman with a high-risk HPV infection, smoking increases the risk of developing a cervical cancer lesion. Smoking cessation is one of the most important behavioral changes a woman can make to prevent cervical cancer.

⁷ Foundation for Women's Cancer. Cervical Cancer and Smoking. [Factsheet](#).

Summary of Goals and Objectives

The goals and objectives in this plan address cervical cancer across the cancer control continuum, from primary prevention through survivorship.

Primary Prevention – Prevent cervical cancer from occurring.

- By 2026, increase the percentage of adolescents ages 13 to 17 in Indiana who are up-to-date on the human papillomavirus vaccine from 40.8% to 80%.
- By 2021, decrease the current smoking prevalence among female high school students in Indiana from 8.2% to 6%.
- By 2021, decrease the current smoking prevalence among adult women 18 years and older in Indiana from 20.1% to 15%.

Early Detection – Increase guideline-based screening for early detection of cervical cancer.

- By 2023, increase the percentage of females in Indiana who are receiving recommended cervical cancer screenings according to the United States Preventive Services Task Force (Pap test in the last three years, ages 21-29: 68.3% to 93%; Pap test alone in the last three years, human papillomavirus test alone in the last five years, or cotesting in the last five years, ages 30-65: 68.3%* to 93%).

*Due to data limitations, baseline measure does not include cotesting and is not specific to testing for high-risk human papillomavirus.

- By 2028, reduce the percentage of late-stage (regional and distant) cervical cancer diagnoses in Indiana from 54.0% to 40%.

Treatment – Promote shared decision-making and ensure accessible and evidence-based care for cervical cancer.

- By 2023, increase the number of board-certified gynecologic oncologists in Indiana from 0.22 gynecologic oncologists per 100,000 people to the national average of 0.34 gynecologic oncologists per 100,000 people.
- By 2021, maintain the number of cervical cancer clinical trials available for women in Indiana from 6 to 6.
- By 2021, increase the percentage of women with cervical cancer participating in clinical trials in Indiana from 4.3% to 6.6%.
- (Developmental) By 2021, increase the number of women with cervical cancer who are offered palliative/supportive care after diagnosis in Indiana.

Survivorship – Improve quality of life for all those affected by cervical cancer.

- By 2021, decrease the percentage of cervical cancer survivors in Indiana who report being current smokers from 37.2% to 14.5%.

HOUSE ENROLLED ACT No. 1278

AN ACT to amend the Indiana Code concerning health.

Be it enacted by the General Assembly of the State of Indiana:

SECTION 1. IC 16-46-15 IS ADDED TO THE INDIANA CODE AS A NEW CHAPTER TO READ AS FOLLOWS [EFFECTIVE JULY 1, 2017]:

Chapter 15. Strategic Plan to Reduce Cervical Cancer

Sec. 1.

(a) The state department shall develop a strategic plan to identify and significantly reduce morbidity and mortality from cervical cancer.

(b) In developing the strategic plan under subsection (a), the state department shall collaborate with the following:

(1) The office of the secretary of family and social services.

(2) The Indiana University Melvin and Bren Simon Cancer Center.

(3) The University of Notre Dame Harper Research Institute.

(4) The Purdue University Center for Cancer Research.

(c) The state department may establish workgroups to assist in the development of the strategic plan. The members of a workgroup may include the following:

(1) Health care providers specializing in cervical cancer prevention, screening, treatment, or research.

(2) Physicians specializing in primary care, pediatrics, or obstetrics and gynecology.

(3) Health care providers who provide direct patient care.

(4) Cancer epidemiologists.

(5) Representatives of a postsecondary educational institution that offers a baccalaureate or higher degree course of study that enables students to teach in Indiana upon graduation.

(6) Any medical, nursing, and dental school located in Indiana.

(7) Middle school, high school, or college level health instructors.

(8) Cervical cancer survivors.

(9) Representatives from geographic areas or other population groups at higher risk for cervical cancer.

(10) Public health advocates who work with cervical cancer.

(11) Representatives of community based and faith based organizations involved in providing education, awareness, or support relating to cervical cancer.

(12) Any other persons the state department determines are necessary.

Sec. 2.

In developing the strategic plan under section 1 of this chapter, the state department shall:

- (1) identify barriers to effective prevention, screening, and treatment for cervical cancer, including specific barriers affecting providers and patients;
- (2) identify methods, other than a mandate, to increase the number of people vaccinated against human papillomavirus;
- (3) identify methods to increase use of evidence based screening to increase the number of people screened regularly for cervical cancer;
- (4) review current technologies and best practices for cervical cancer screening;
- (5) review technology available to diagnose and prevent infection by human papillomavirus;
- (6) develop methods for creating partnerships with public and private entities to increase awareness of cervical cancer and of the importance of vaccination education and regular screening;
- (7) review current human papillomavirus prevention, screening, treatment, and related activities in Indiana and identify areas in which the services for those activities are lacking;
- (8) estimate the annual direct and indirect state health care costs attributable to cervical cancer; and
- (9) identify actions necessary to increase vaccination and screening rates and to reduce the morbidity and mortality from cervical cancer, and establish a schedule for implementing those actions.

Sec. 3.

Before December 31, 2018, the state department shall deliver a written report to the governor and, in an electronic format under IC 5-14-6, to the general assembly that includes:

- (1) the strategic plan developed under section 1 of this chapter; and
- (2) recommendations on goal implementation and schedule compliance related to the strategic plan developed under section 1 of this chapter.

Sec. 4.

This chapter expires January 1, 2019.

Plan Framework (Defining Terms) and How it Aligns with State Cancer Control Plan

The Indiana Cervical Cancer Strategic Plan 2019-2028 identifies the policies, changes, and actions required at all levels, from statewide to individual, to reduce the burden of cervical cancer in Indiana. This plan, as required by HEA 1278, contains focus areas, goals, SMART and developmental objectives, and strategies.

Goals

The goals of the plan are modeled after the cancer control continuum and align with the Indiana Cancer Control Plan 2018-2020. Goals establish and advise the general outcomes of the plan.

- Primary Prevention – Prevent cervical cancer from occurring.
- Early Detection – Increase guideline-based screening for early detection of cervical cancer.
- Treatment – Promote shared decision-making and ensure accessible and evidence-based care for cervical cancer.
- Survivorship – Improve quality of life for all those affected by cervical cancer.

Objectives

Objectives identify key priorities that will make the most significant impact on Indiana's cervical cancer burden. Each objective was developed and reviewed by subject matter experts who elevated priorities based on current research, achievability, equitability, effectiveness, and sustainability. There are currently 10 objectives in the plan; however, as priority cervical cancer control topics emerge and evidence increases, other objectives can be added.

Most of the objectives are SMART (specific, measurable, attainable, relevant, and time-phased) objectives. However, formulating SMART objectives is not always possible, especially when baseline data is scarce or unavailable. There is one developmental objective in this plan. The first strategy for this objective is to identify a data source to determine a baseline measure and target, and to assess progress.

Strategies

Each objective is supported by evidence-based, best, or promising practices, which if implemented will increase the likelihood of meeting the plan's targets. Strategies include policies, programs, communications, interventions, or activities vital to improving cervical cancer prevention and control efforts in each phase of the cancer continuum.

Measures

Measures present information to evaluate progress toward specific objectives. SMART objectives include baseline and target measures. For the measure that will be identified at a later date (developmental), there will be a note. Data sources for the objectives and measures in this plan include the National Immunization Survey – Teen, Behavioral Risk Factor Surveillance System, Indiana State Cancer Registry, 50 Shades of Teal Report, and clinicaltrials.gov.

Process and Key Collaborators

Effective July 1, 2017, HEA 1278 required the Indiana State Department of Health (ISDH) to develop a strategic plan to identify and significantly reduce morbidity and mortality from cervical cancer.

The ISDH planned and hosted a statewide Cervical Cancer Strategic Planning Kickoff in September at the American Cancer Society in Indianapolis. More than 30 partners from across the state attended the full-day event (see agenda and full list of attendees in Appendix B). The morning portion of the kickoff included presentations of data, evidence-based practices, and lessons-learned in the areas of cervical cancer prevention, early detection, treatment, and survivorship from subject matter experts.

Initially, the proposed overarching goal for the Indiana Cervical Cancer Strategic Plan followed the legislation: to reduce morbidity and mortality of cervical cancer in Indiana. However, after extensive discussion, it was decided at the kickoff that the overarching long-term goal should be more aspirational in nature – To eliminate cervical cancer in Indiana. The group also discussed the plan duration, with three, five, and 10 years proposed as options. While there was no consensus on the overall duration of the plan, participants agreed that there needs to be some interval for reviewing progress in three to five years. The focus areas identified for the plan include Primary Prevention, Early Detection, Treatment, and Survivorship.

The criteria to assess impactful, powerful objectives included:

- Data-driven:** Data sources exist to measure regular progress on the objective.
- Achievability:** The objective can be addressed within the planning cycle.
- Collaborative Potential:** It is a shared objective that no single organization can accomplish alone.
- Potential for Impact:** Evidence suggests the objective will reduce cervical cancer incidence, increase survival rates, and/or improve quality of life.

The ISDH worked to incorporate and address feedback from external partners and partnered with Cynthia K. Lewis & Associates, LLC, an external consultant, to estimate the annual direct and indirect state health care costs attributable to cervical cancer in Indiana (see Appendix C).

Burden of Cervical Cancer in Indiana

Incidence and Mortality

On average, 264 women in Indiana are diagnosed with cervical cancer each year and 88 die from this type of cancer annually (Table 1). Table 2 shows the number of cases by age observed between the years 2012 and 2016. Cervical cancer usually occurs among women in their childbearing years and beyond, with an average age of diagnosis between the ages of 50 to 55 years. In Indiana, approximately 43% of cervical cancers were diagnosed among women aged 45 to 64 years. It is estimated that 290 new cases of cervical cancer will occur in Indiana during 2018.⁸

Table 1. Cervical cancer incidence and mortality, Indiana, 2012-2016

	2012-2016	
	Average Number of Cases	Rate per 100,000* Women
Incidence	264	8.0
Mortality	88	2.5

*Age-adjusted to the US 2000 Standard Population

Source: Indiana State Cancer Registry

Table 2. Cervical cancer incidence counts and percentage of total cases by age at diagnosis, Indiana, 2012-2016

Age (years)	Number of Cases	Percent of Total Cases
< 35	200	15.2%
35-39	136	10.3%
40-44	181	13.7%
45-49	160	12.1%
50-54	167	12.7%
55-59	126	9.5%
60-64	117	8.9%
65+	233	17.7%

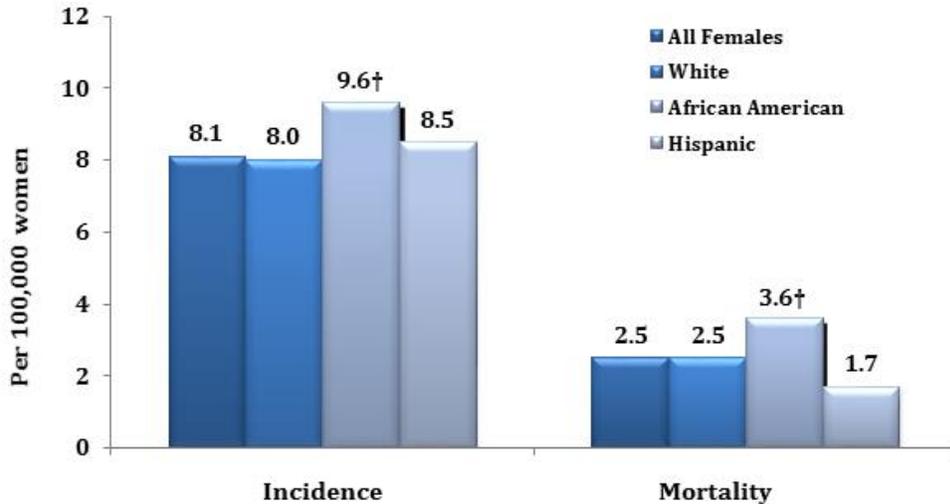
Source: Indiana State Cancer Registry

In Indiana, both incidence and mortality for cervical cancer are highest among African American women compared to White women and Hispanic women, and mortality is lowest among Hispanic women. Figure 1 presents the average annual cervical cancer incidence and mortality rates by race/ethnicity from 2002 to 2016. During the same time period, 47 new cases and 22

⁸ American Cancer Society. Cancer Statistics Center. Indiana. [Webpage](#). Accessed on 10/3/2018.

deaths from cervical cancer occurred among Asian Pacific Islanders. These numbers were too small to calculate stable incidence and mortality rates for this group.

Figure 1. Cervical cancer incidence and mortality by race/ethnicity, Indiana, 2002-2016*



*Age-adjusted to the US 2000 Standard Population.

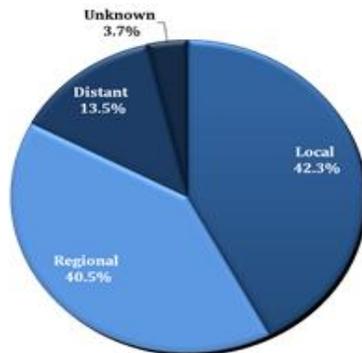
†Rate among African American women is significantly higher ($P<0.05$) than the rate among White women.

Source: Indiana State Cancer Registry

Survival and Staging

The five-year survival rate for cervical cancer is 91.7% if detected at an early (local) stage, falling to 56.0% for regional cancers, and 17.2% for cancers diagnosed at more advanced (distant) stages.⁹ Over half (54%) of the cervical cancers diagnosed in Indiana between 2012 and 2016 were detected at late (regional or distant) stages (Figure 2).

Figure 2. Stage distribution of invasive cervical cancer cases, Indiana, 2012-2016*



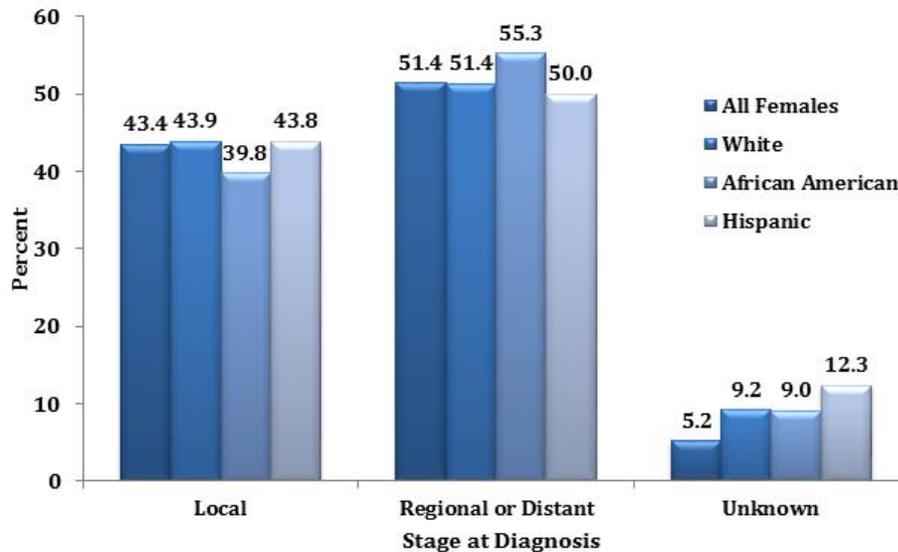
*Only includes invasive cases; in situ cases are not reportable

Source: Indiana State Cancer Registry

⁹ National Cancer Institute: Surveillance, Epidemiology, and End Results Program. Cancer Stat Facts: Cervical Cancer. [Webpage](#). Accessed on 08/22/2018.

There is some variation by race/ethnicity (Figure 3). African American women are more likely to be diagnosed at late stages of cervical cancer compared to White women.

Figure 3. Percent of invasive cervical cancer cases by stage of diagnosis and race/ethnicity, Indiana, 2002-2016*



*Only includes invasive cases; in situ cases are not reportable
Source: Indiana State Cancer Registry

Costs of Cervical Cancer

Cervical cancer carries both direct and indirect costs. The direct costs included in this estimate are hospital inpatient costs, physician office visit costs, and medication costs for individuals treated with cervical cancer. The direct cost estimate is conservative since it does not include all other direct healthcare costs, such as nursing home or in-home medical care, as these data were not available. The indirect estimates vary depending on the method used to estimate mortality cost. Two methods were used to estimate the mortality cost associated with cervical cancer in Indiana - the Present Value of Lifetime Earnings (PVLE) method and the Value of a Statistical Life (VSL) method. Both of these methods are considered conservative, as neither includes all economic impact variables associated with the loss of a life. The PVLE method yields a more conservative estimate than the VSL method, since it only includes lost earnings as a result of premature death. The VSL method results in a higher dollar value for premature loss of life because it assigns a monetary value to pain and suffering and loss of companionship. In 2017, the estimated direct healthcare cost for cervical cancer in Indiana was \$54,634,601 (see Appendix C). In 2017, the estimated mortality (indirect) costs for cervical cancer in Indiana ranged from \$57,739,290, using the PVLE method, to \$331,973,460, using the VSL method (see Appendix C).

In addition to direct and indirect costs associated with cervical cancer, estimates were developed for cervical cancer costs attributed to human papillomavirus (HPV) exposure. In 2017, the estimated direct health care cost of cervical cancer attributed to HPV exposure in Indiana was

\$49,717,487 (see Appendix C). In 2017, the estimated mortality (indirect) costs of cervical cancer attributed to HPV ranged from \$52,790,208, using the PVLE method, to \$300,452,774, using the VSL method (see Appendix C).

Health Equity

Health inequities are systemic differences in the health status of different population groups. These inequities often have considerable social and economic costs both to individuals and societies. Healthy People 2020 defines health equity as the “attainment of the highest level of health for all people. Achieving health equity requires valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities, historical and contemporary injustices, and the elimination of health and health care disparities.” Factors such as a lack of access to cervical cancer screening and treatment, being uninsured or underinsured, and other socioeconomic barriers can contribute to poor early detection of cervical cancer and higher mortality. Cancer disparities can be eliminated if we focus on promoting health equity for everyone.

Racial/Ethnic Disparities

In Indiana, the incidence of cervical cancer from 2002-2016 was approximately 18% higher among African American women compared to White women, and cervical cancer mortality was approximately 36% higher for African American women. The proportion of women who reported having a Pap test during the past three years varied little by race: 75.3% for White women, 74.5% for African American women, and 74.6% for Hispanic women.

Geographic Disparities

Overall incidence and mortality rates for urban compared to rural counties are presented in Table 3. Rural counties have significantly higher cervical cancer incidence rates than urban counties; however, rural counties do not have significantly different cervical cancer mortality rates than urban counties. Figures 4 and 5 show incidence and mortality from cervical cancer by county, from 2002 to 2016.

Table 3. Cervical cancer incidence and mortality by rural/urban status, Indiana, 2002-2016*

	Indiana	Urban Counties	Rural Counties
Incidence	8.1	8.0	8.6†
Mortality	2.5	2.5	2.7

*Number of cases per 100,000 women; age-adjusted to the 2000 US Standard Population

†Rate among rural counties is significantly higher ($P<0.05$) than the rate among urban counties.

Source: Indiana State Cancer Registry

Data from the 2016 Behavioral Risk Factor Surveillance System (BRFSS) do not suggest rural/urban disparities in cervical cancer screening. The proportion of women who reported having a Pap test during the past three years was 74.4% for women residing in urban counties and 74.9% for women residing in rural counties.

Socioeconomic Status (SES)-Related Disparities

As with other cancers, higher mortality from cervical cancer is associated with lower income, lower education, and lower SES overall. There is currently no reliable data source to explore cervical cancer diagnoses and deaths in Indiana by income, insurance status, and other socioeconomic factors. A total of 72 women responding to the 2016 Indiana BRFSS reported ever having cervical cancer. Although respondents were queried about income, insurance status, and other SES-related factors, the majority (86.1%) of the 72 women reported being diagnosed with cervical cancer five or more years prior to the BRFSS interview. Therefore, SES-related information reported for 2016 may not accurately reflect a woman’s circumstances at her time of diagnosis. Of the 72 women, 40 responded “yes” to the question, “Did health insurance pay for all of your cancer treatment?”

Data from the 2016 Indiana BRFSS suggest disparities in cervical cancer screening by income. The proportion of women who reported having a Pap test during the past three years was lowest for the median household income of \$25,000-\$34,999 (Table 4) and increased as household incomes rose.

Table 4. Percent of women who reported having a Pap test during the past three years by household income, 2016

Household Income	Percent
<\$15,000	67.6%
\$15-\$24,999	67.1%
\$25-\$34,999	63.4%
\$35-\$49,999	68.9%
>=\$50,000	84.7%

Source: 2016 Indiana BRFSS

Data from 25 Federally Qualified Health Centers (FQHC) throughout Indiana indicate that during 2016, on average, 48% of women served received cervical cancer screening. These FQHCs served over 473,000 patients during 2016, more than 90% percent of whom were at or below 200% of the Federal Poverty Level.

Figure 4. Cervical cancer incidence in Indiana, 2002-2016

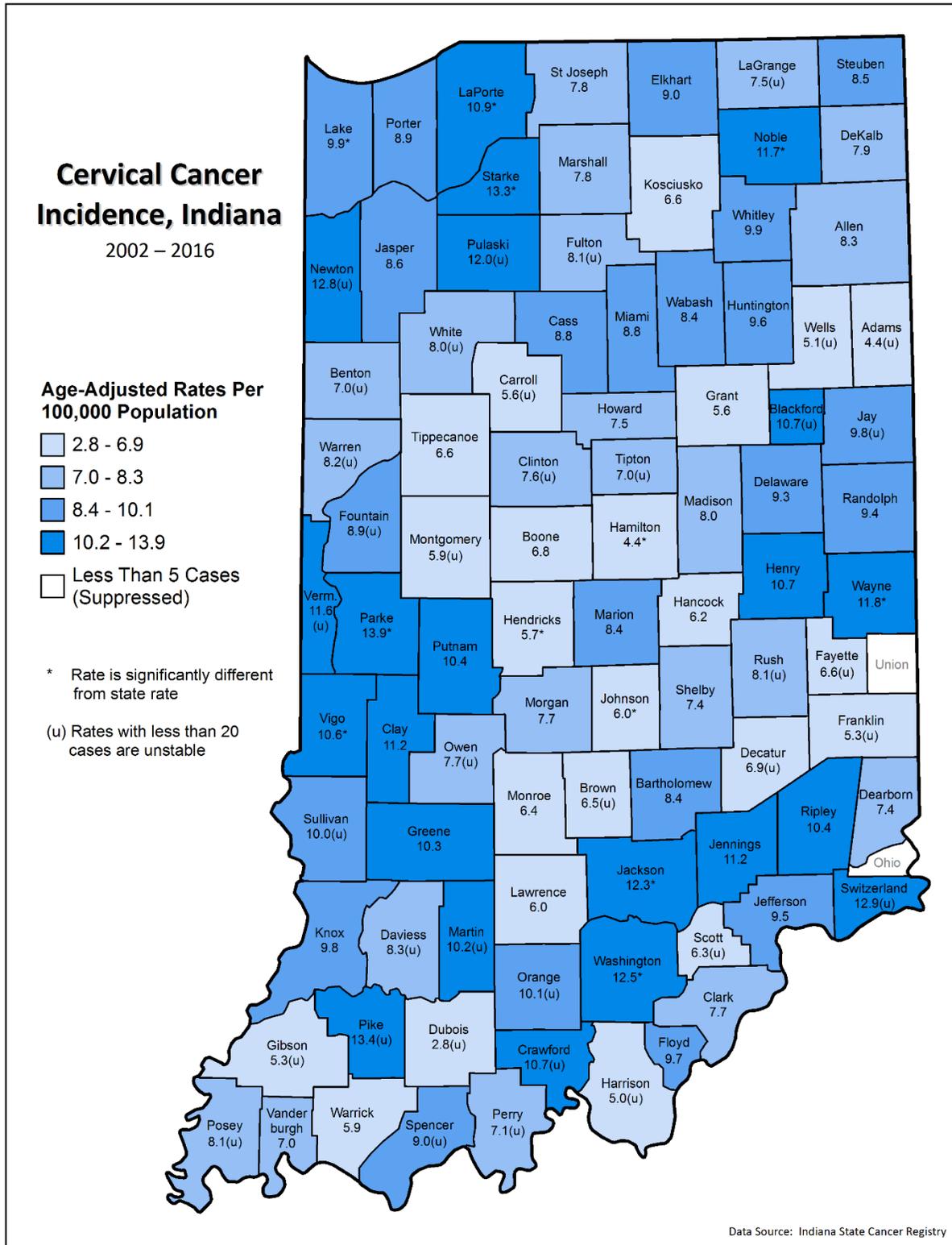
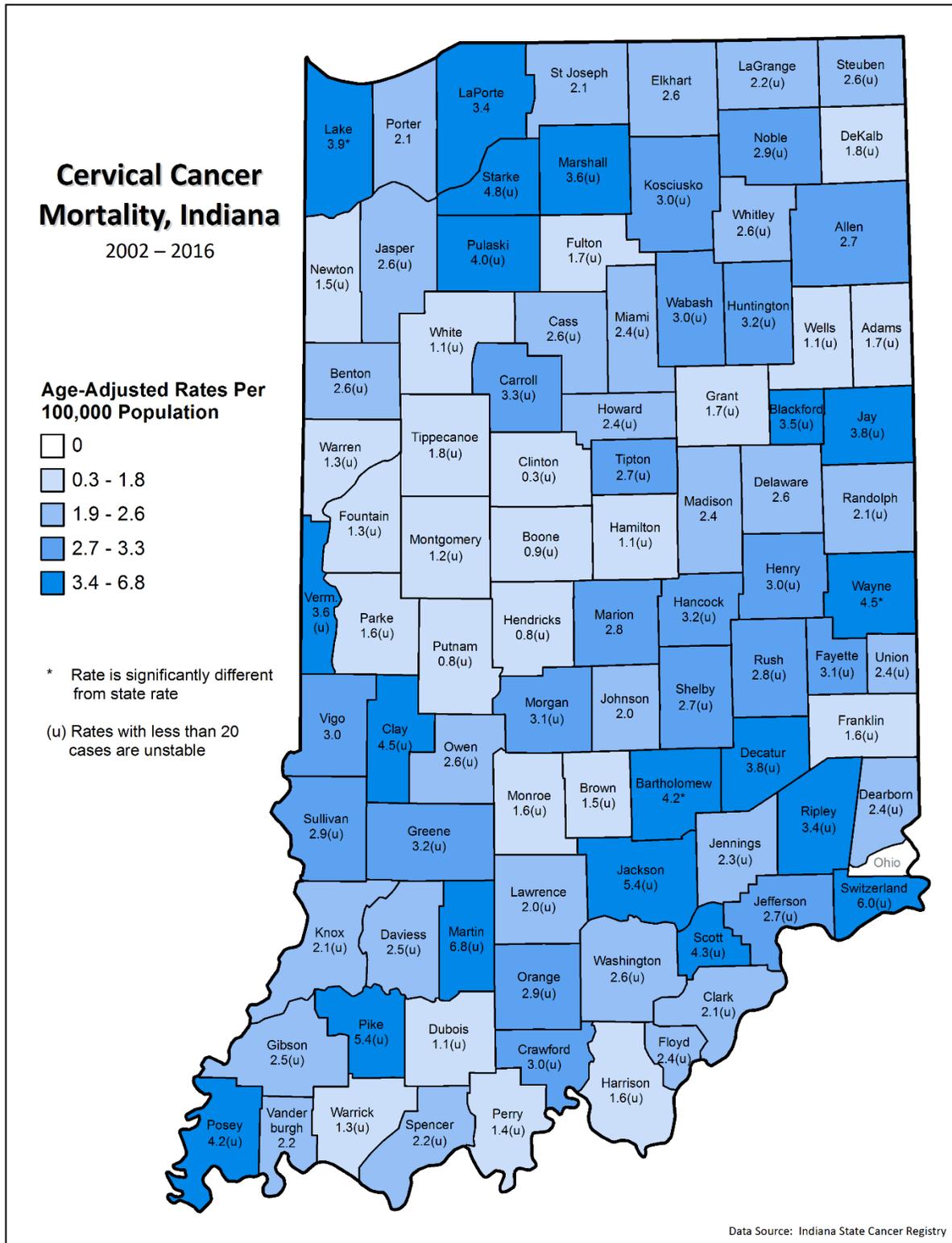


Figure 5. Cervical cancer mortality in Indiana, 2002-2016



Primary Prevention

Evidence shows that cervical cancer is nearly 100 percent preventable. Through regular screening, avoidance of controllable risk factors, and vaccination against the human papillomavirus (HPV), cervical cancer can be avoided in nearly all cases.

Nationally, in 2018, there will be an estimated 13,240 cases of cervical cancer diagnosed and 4,170 deaths due to cervical cancer, according to the American Cancer Society. Widespread implementation of Pap testing in the 1960s led to large declines in cervical cancer incidence, but there has been little reduction in cervical cancer rates over the past several years. On average, 264 women in Indiana are diagnosed with cervical cancer each year and 88 die from this type of cancer (Table 1).

The main risks factors for cervical cancer include HPV infection, smoking, and having a weakened immune system. These factors can sometimes act together, or in sequence, to cause cervical cancer.

Cervical cancer can be prevented through changes in lifestyle and behavior. Although HPV infections are very common, they are easily prevented. Risk of HPV infection – which is passed person-to-person through skin-to-skin sexual contact – can be nearly eliminated by HPV vaccination. The HPV vaccine can prevent cervical, head, neck, penile, anus, and other cancers. In addition, risk of contracting HPV can be reduced by delaying first sexual activity, limiting the number of sexual partners, and using condoms. Although cervical cancer is primarily caused by HPV, sufficient evidence has been collected to infer a causal relationship between smoking and cervical cancer.¹⁰ HPV vaccination and smoking cessation are two important lifestyle changes that an individual can make to prevent cervical cancer.

In Indiana, HPV vaccination rates are much lower than the rates of other recommended adolescent vaccines. In 2017, vaccination rates for the recommended Tdap and MenACWY vaccines were 95.1% and 93.1% respectively for Indiana adolescents ages 13-17. However, the up-to-date HPV vaccination rate was only 40.8% for adolescents ages 13-17 in Indiana.¹¹ All three of these adolescent vaccines are recommended by the Centers for Disease Control and Prevention and the Advisory Committee for Immunization Practices to be given at the same age.¹² Providers should be offering these three recommended adolescent vaccines in the same way at the same visit¹³; however, many Indiana providers are missing opportunities for HPV vaccination administration (see Figure 6), with some having an HPV vaccination rate below 25% among their respective patient populations (see Figure 7).

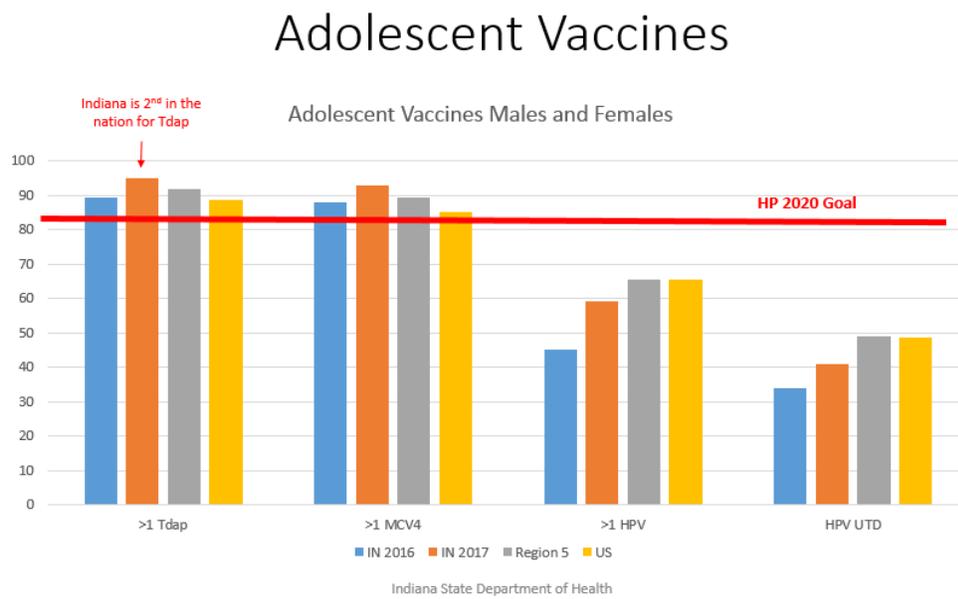
¹⁰ Centers for Disease Control and Prevention. Highlights: Smoking Among Adults in the United States: Cancer. [Webpage](#). Accessed on 10/31/2018.

¹¹ Centers for Disease Control and Prevention. National, Regional, State, and Selected Local Area Vaccination Coverage among Adolescents Aged 13–17 Years — United States, 2017. [Report](#).

¹² Indiana Immunization Coalition. About the HPV MOC Project. [Webpage](#). Accessed on 10/26/2018.

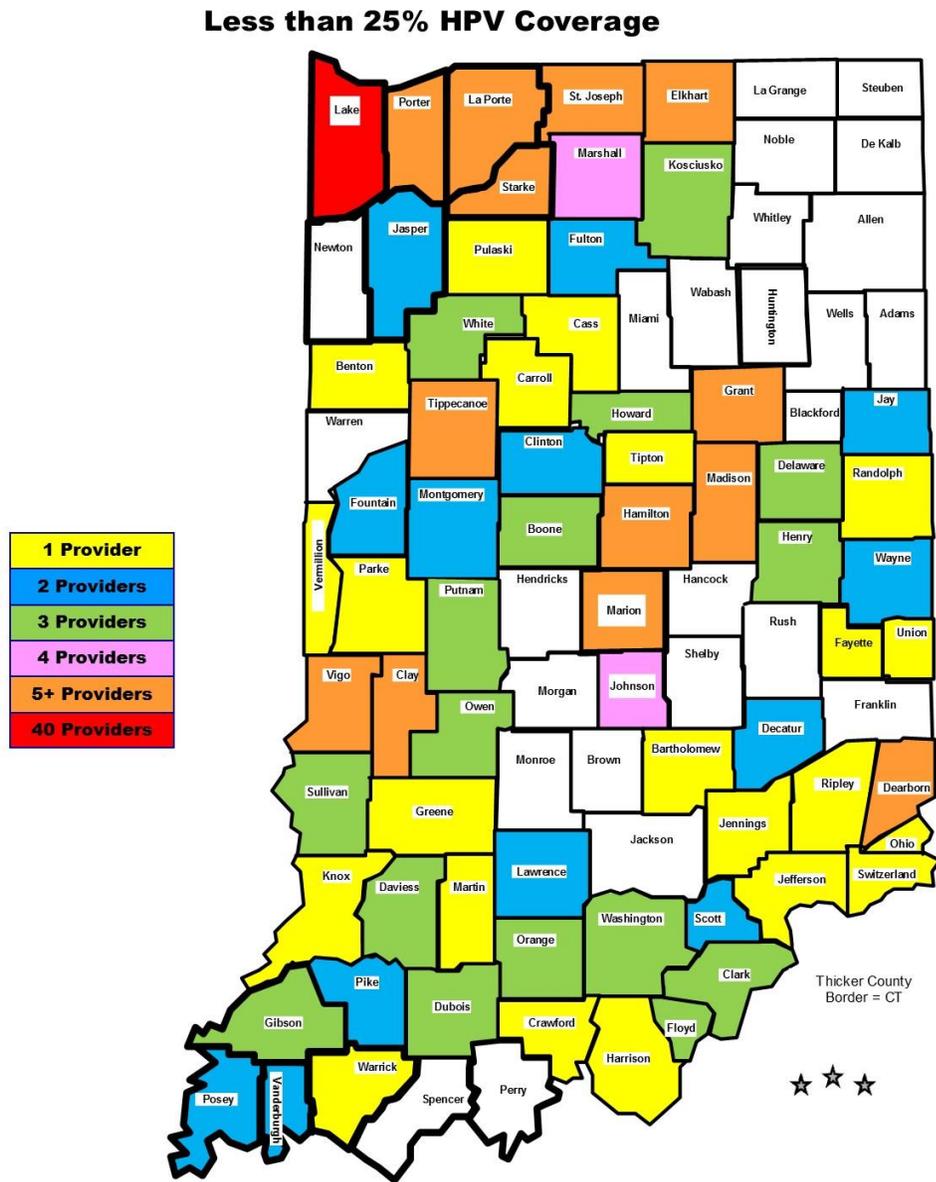
¹³ President’s Cancer Panel. HPV Vaccination for Cancer Prevention: Progress, Opportunities, and a Renewed Call to Action. 2018. [Report](#).

Figure 6. Adolescent vaccination rates by vaccine



Source: National Immunization Survey – Teen, 2017

Figure 7. Provider HPV vaccination coverage by county, up-to-date rates for adolescents, 11-12 years, Indiana, 2017



Source: Indiana State Department of Health Immunization Information System

Goal: Prevent cervical cancer from occurring

Objective 1: By 2026, increase the percentage of Indiana adolescents ages 13 to 17 who are up to date on the HPV vaccine.

Data Source	Baseline (2017)	Target
2017 National Immunization Survey - Teen	40.8%	80%

Strategies –

- Support inclusion of HPV vaccination as part of the vaccination regimen for students entering sixth grade.
- Encourage insurer-based incentives for providers who increase their adolescent vaccine completion outcomes (including HPV).
- Implement provider vaccination reminders into electronic medical records (EMR) systems as well as patient reminder/recall systems to improve vaccination series completion.
- Promote opportunities for pharmacies to offer HPV vaccinations.
- Target HPV vaccination communication messaging to pediatricians who report adolescent vaccinations but not HPV.
- Encourage clear communication from doctors, nurses, and other healthcare professionals about the negative health impact of HPV infection and the role of the HPV vaccine in cancer prevention.
- Encourage healthcare professionals to routinely and strongly recommend HPV vaccination as part of the adolescent vaccination platform at ages 11-12 years (MCV4, HPV, Tdap, and Influenza vaccines).
- Offer HPV vaccine continuing medical education for primary care, family medicine, pediatrics, obstetrics, gynecology, and advanced practice healthcare providers.
- Offer educational opportunities for stakeholders to gain knowledge about the HPV vaccination from health professionals.
- Improve access to HPV vaccination through programs that serve adolescent populations.
- Conduct educational campaigns to increase public awareness of the link between HPV and cancer.
- Issue a “Cancer Vaccine Report Card” for Indiana with focus on vaccine-preventable cancer diseases (hepatitis B and HPV) that can cause cancer.
- Link the Children and Hoosier Immunization Registry Program and Indiana State Cancer Registry data.
- Promote the use of data from national surveillance systems.

Objective 2: By 2021, decrease the current smoking prevalence among female high school students in Indiana.

Data Source	Baseline (2016)	Target
2016 Youth Tobacco Survey	8.2%	6%

Strategies –

- Support youth mobilization to increase anti-tobacco attitudes.
- Educate teachers, parents and the community about emerging tobacco products, including Electronic Nicotine Delivery Systems (ENDS), as youth may be experimenting with and regularly using these products that can go easily undetected.
- Promote school-based policy and interventions.
- Provide education to communities about tobacco-free environments for all youth (school, work, home, and public).
- Educate state-level school stakeholder organizations, local school administrators, and policymakers on the importance of tobacco-free school environments, including ENDS, by providing model policies and promoting the successful outcomes from school districts that have implemented school policies.
- Implement strategies to reduce tobacco use among rural youth.
- Collaborate with asthma, diabetes, and adolescent health programs to holistically approach chronic disease management and tobacco prevention.
- Encourage statewide school stakeholder organizations and youth-serving organizations to include tobacco prevention on their annual training agenda and as a part of their strategic plan.
- Encourage participation in national and state activities, such as the Campaign for Tobacco-Free Kids “Kick Butts Day,” World No Tobacco Day, and other events.
- Expand media messages from state and national tobacco prevention campaigns that include communication and dialogue on social networks.
- Increase capacity of healthcare providers to identify youth tobacco users at annual visits and to provide appropriate tobacco treatment and counseling for youth as recommended by the U.S. Public Health Service, Clinical Practice Guideline for Tobacco Treatment and Dependence, through emphasis to pediatricians and healthcare providers focusing on chronic diseases among youth (asthma, diabetes for example).
- Increase awareness among mental health and substance abuse treatment professionals of higher use of tobacco among youth experiencing depression and mental illness.
- Increase awareness of the Indiana Tobacco Quitline services for youth.

- Maintain surveillance systems to monitor and respond to youth tobacco use trends, including other tobacco products and use of emerging products, as well as attitudes, by conducting the Indiana Youth Tobacco Survey.
- Disseminate the key findings and data from the Indiana Youth Tobacco Survey to school administrators and key stakeholders.
- Build collaboration with key school stakeholder organizations, such as state superintendents, principals, school board, school nurses associations, state youth organizations and other related groups, to engage them in tobacco prevention strategies, with a focus on tobacco-free environments.

Objective 3: By 2021, decrease the current smoking prevalence among adult women 18 years and older in Indiana.

Data Source	Baseline (2017)	Target
2017 Behavioral Risk Factor Surveillance System (BRFSS)	20.1%	15%

Strategies –

- Educate healthcare systems on the U.S. Public Health Service Clinical Practice Guideline for Tobacco Use Treatment and Dependence.
- Educate health plans, employers, and health insurance providers about comprehensive tobacco use cessation.
- Disseminate return on investment (ROI) messages to educate business, decision makers and public on investing in tobacco cessation.
- Work with Indiana Medicaid to promote the eligibility for Quitline services.
- Partner with key stakeholders to develop strategies to reduce out-of-pocket treatment costs for cessation services.
- Promote the services available through the Indiana Tobacco Quitline through various mediums.
- Conduct mass media education campaigns promoting quitting and ways that smokers can get help to quit.
- Partner with maternal and child health providers and organizations statewide, such as obstetrician-gynecologists, Indiana Women, Infants and Children and Maternal and Child Health clinics, and Family and Social Services Administration family outlets to provide and promote tobacco treatment resources for women of child-bearing age.
- Educate consumers about evidence-based methods proven safe for quitting.
- Educate stakeholders about proven clinical preventive services for tobacco treatment to 1) provide incentives to healthcare providers for achieving high delivery rates for recommended services and to 2) employers for establishing workplace health promotion programs and policies.

- Support healthcare systems recommended by the U.S. Public Health Service Clinical Practice Guideline for Tobacco Use Treatment and Dependence.
- Work with healthcare provider groups and health systems to integrate referral to the Indiana Tobacco Quitline into electronic health record systems.
- Maintain an outcome-based evaluation of Quitline services established by the minimum data standards of the North American Quitline Consortium.
- Sustain state level surveillance systems for cessation indicators, such as those included in the Indiana Adult Tobacco Survey and the BRFSS.
- Monitor the prevalence of traditional, non-traditional, and emerging tobacco products among Indiana adults through state level surveillance systems such as the Indiana Adult Tobacco Survey and BRFSS.
- Support research and evaluation efforts to show efficacy of cessation initiatives and need for sustained services of the Indiana Tobacco Quitline.

Early Detection

Nationally, in 2018, there will be an estimated 13,240 cases of invasive cervical cancer diagnosed and 4,170 deaths due to invasive cervical cancer.¹⁴ Most invasive cervical cancers are found in women who have not had regular Pap tests. A proven way to prevent cervical cancer is to have testing, or screening to find pre-cancers before they turn into invasive cancer.¹⁵ Removal of precancerous lesions, found through the screening process, leads to reducing mortality from cervical cancer. Advanced stage cervical cancer diagnoses are more common among low-income women. In Indiana, the proportion of women who reported having a Pap test increased as household income rose. Furthermore, once the disease is diagnosed, low-income women have higher-than-expected mortality.

The United States Preventive Services Task Force (USPSTF) is an independent panel of national experts that makes evidence-based recommendations about clinical preventive and detection services, such as screenings, counseling services, and preventive medications. Task force members come from the fields of preventive medicine and primary care, including internal medicine, family medicine, pediatrics, behavioral health, obstetrics and gynecology, and nursing. Their recommendations are based on a rigorous review of existing peer-reviewed evidence and are intended to help primary care clinicians and patients decide together whether a preventive service is right for a patient's needs.

Guidelines are continually changing as scientific updates are developed.¹⁶ On August 21, 2018, the USPSTF updated its screening recommendations for cervical cancer. The new recommendations include:

- Screening for cervical cancer every three years with cervical cytology alone in women aged 21 to 29 years. For women aged 30 to 65 years, the USPSTF recommends screening every three years with cervical cytology alone, every five years with high-risk human papillomavirus (hrHPV) testing alone, or every five years with hrHPV testing in combination with cytology (cotesting).

The Community Guide provides evidence-based findings and recommendations from the Community Preventive Services Task Force (CPSTF) about community preventive services and programs to improve health. The CPSTF — an independent, nonfederal panel of public health and prevention experts — bases its findings on systematic reviews of the scientific literature. The CPSTF recommends proven intervention strategies, including programs and services, to increase screening for cancer among underserved populations. If implemented, these strategies:

- Get more people screened for breast, cervical, and colorectal cancers;
- Educate people about cancer screening and help people overcome barriers to services;
- Improve access to screening; and
- Increase provider delivery of screening services.

¹⁴ American Cancer Society. Cancer Facts and Figures 2018. [Report](#).

¹⁵ American Cancer Society. Cervical Cancer Prevention. [Webpage](#). Accessed on 8/30/2018.

¹⁶ For the current USPSTF screening guideline recommendations, visit the [USPSTF webpage](#).

The National Breast and Cervical Cancer Early Detection Program (NBCCEDP) provides breast and cervical cancer screening services to low-income, medically underserved, uninsured, and underinsured women in the US.¹⁷ The NBCCEDP functions through cooperative agreements with the Centers for Disease Control and Prevention (CDC) and state and territorial health departments, tribes, and organizations. The NBCCEDP currently serves women in all 50 states, the District of Columbia, six U.S. territories, and 13 American Indian/Alaskan Native tribes or tribal organizations.

The Indiana Breast and Cervical Cancer Program (IN-BCCP) is the Hoosier implementation of the NBCCEDP.¹⁸ The IN-BCCP provides access to breast and cervical cancer screenings, diagnostic testing, and treatment for Indiana women who qualify for services. The IN-BCCP receives funds from both the NBCCEDP and from the State of Indiana and serves roughly 5,000 women, annually. The types of services covered under the IN-BCCP include, patient navigation services, Pap tests, and high-risk panel HPV testing.^{18,19}

¹⁷ American Cancer Society Cancer Action Network. How Do You Measure Up? 2018. [Report](#).

¹⁸ Indiana State Department of Health. Indiana Breast and Cervical Cancer Program. [Webpage](#). Accessed on 9/14/2018.

¹⁹ [High-risk panel HPV testing](#): This testing looks for the types of HPV most likely to cause cervical cancer.

Goal: Increase guideline-based screening for the early detection of cervical cancer.

Objective 1: By 2023, increase the percentage of females in Indiana who are receiving recommended cervical cancer screenings according to the USPSTF.

Data Source	Target Population	Baseline (2016)	Target
2016 Behavioral Risk Factor Surveillance System	Pap testing in last 3 years, ages 21-29 years	68.3%	93%
	Pap testing alone in last 3 years, HPV testing alone in last 5 years, or cotesting in the last 5 years; ages 30-65 years	68.3%*	93%

*Due to data limitations, baseline measure does not include cotesting and is not specific to testing for hrHPV.

Strategies –

- Conduct one-on-one educational sessions by phone or in-person in a variety of settings.²⁰
- Conduct group education sessions with a health professional in a faith based organization, home, community based organization, or other setting.
- Use small media to educate patients and healthcare providers about screening (i.e. distribute evidence-based videos, and printed materials such as letters, brochures, and newsletters through community settings or healthcare systems).²⁰
- Encourage providers to give a strong recommendation for cervical cancer screening to females who are due for screening.
- Utilize community health workers, patient navigators, and lay health advisors to offer assistance to patients who have identified barriers to cervical cancer screening.
- Assess how many patients receive screening services and provide feedback on provider performance.
- Send reminders to patients who are due for screening (such as letters, emails, phone calls or text messages) to increase screening rates.²⁰
- Work with providers to promote provider reminder systems that inform providers when a patient is due or overdue for services.²¹
- Reduce structural barriers by offering flexible clinic hours and on-site translators.²⁰
- Promote IN-BCCP services to increase access to high-risk panel HPV testing.
- Improve efforts to recruit additional IN-BCCP providers to create more uniform community access to cancer screening services across the state.

²⁰ Community Preventive Services Taskforce. What Works: Cancer Screening. [Factsheet](#).

²¹ DeGross A et al. (2017) Using Evidence-based Interventions to Improve Cancer Screening in the National Breast and Cervical Cancer Early Detection Program. [Journal Article](#).

Objective 2: By 2028, reduce the percentage of late-stage (regional and distant) cervical cancer diagnoses in Indiana.

Data Source	Baseline (2012-2016)	Target
Indiana State Cancer Registry, 2012-2016	54.0%	40%

Strategies –

- Develop culturally competent screening resources.
- Increase public awareness regarding screening with clear, simple messaging to improve reach to disparate populations (geography, income, race and/or ethnicity, and primary language).
- Conduct one-on-one educational sessions by phone or in-person in a variety of settings.²⁰
- Conduct group education sessions with a health professional in a faith based organization, home, community based organization, or other setting.
- Enhance methods to identify and describe health disparities.
- Facilitate work with patient navigators to reduce barriers for medically underserved populations. Types of services include transportation arrangement, insurance enrollment, and care coordination.
- Reduce barriers by offering flexible clinic hours and on-site translators.²⁰
- Improve efforts to recruit additional IN-BCCP providers to create more uniform community access to cancer screening services across the state.

Treatment

Treatment options for women diagnosed with cervical cancer are dependent on the stage and extent of disease at the time of diagnosis. The [cervical cancer](#) stage describes its size, depth of invasion (how far it has grown into the cervix), and how far it has spread.

Depending on the type and stage of cervical cancer, more than one type of treatment may be needed. Doctors on the cervical cancer treatment team may include:

- A gynecologist: a doctor who treats diseases of the female reproductive system
- A gynecologic oncologist: a doctor who specializes in management and treatment of cancers of the female reproductive system
- A radiation oncologist: a doctor who uses radiation to treat cancer
- A medical oncologist: a doctor who uses chemotherapy and other medicines to treat cancer

Many other specialists may be involved in care as well, including nurse practitioners, nurses, psychologists, social workers, rehabilitation specialists, supportive/palliative care physicians, and other health professionals.

Common types of treatments for cervical cancer include:

- [Surgery](#)
- [Radiation therapy](#)
- [Chemotherapy](#) (chemo)
- [Targeted therapy](#)
- Palliative care

For the [earliest stages of cervical cancer](#), either surgery or radiation combined with chemo may be used. For [more](#) advanced stages, radiation combined with chemotherapy is usually the main treatment. Chemotherapy (by itself) is often used to treat advanced, or metastatic, cervical cancer. Some cervical cancer patients may be eligible to enroll in clinical trials as part of their treatment. Clinical trials are carefully controlled research studies that are conducted to evaluate promising new treatments or procedures. Clinical trials are one way to get state-of-the-art cancer treatment. In some cases, they may be the only means to access newer treatments. They are also the best way for doctors to learn better methods to treat cancer.²² However, clinical trials have difficulty enrolling participants, specifically ethnic minority and medically underserved participants. Important factors affecting the rates of recruitment into clinical trials include convenience, costs, and conflicts with patient care; complexity; and effect on the patient-physician interaction, including the effects of third-party reimbursement.²³

²² American Cancer Society. Treating Cervical Cancer. [Webpage](#). Accessed on 2/11/2018.

²³ Institute of Medicine (US) Committee on Cancer Research Among Minorities and the Medically Underserved; Haynes MA, Smedley BD, editors. The Unequal Burden of Cancer: An Assessment of NIH Research and Programs for Ethnic Minorities and the Medically Underserved. [Report](#).

Palliative care services aim to improve the quality of life of patients and their families facing problems associated with life-threatening illnesses and conditions, including cancer. Palliative care is not only end-of-life care, but also includes interventions applied throughout the disease to manage all distressing symptoms, including pain, as well as helping to address the emotional and spiritual needs of patients and their families.²⁴ Access to palliative care services is of vital importance for all cancer patients.

The Indiana General Assembly has created the Palliative Care and Quality of Life Advisory Council at Indiana Code (IC) 16-19-17 (P.L. 43 - 2016) to address issues related to palliative care in Indiana. The council has the authority to establish forums, programs, or initiatives designed to educate the public and healthcare providers through comprehensive and accurate information dissemination and education on palliative care and quality of life for individuals with serious illness. The council collects, analyzes, advises, and develops state initiatives to this end and plans to make policy recommendations to improve palliative care throughout the state of Indiana. The council comprises physicians, nurses, social workers, pharmacists, and public health professionals who each bring a unique and experienced perspective on palliative care. In accordance with IC 16-19-17, members are appointed by the state health commissioner and serve three-year terms at the will of the commissioner and without any reimbursement or compensation. The council met for the first time in December 2016 and has continued to meet bimonthly since then. Under the enabling statute, the council expires on June 30, 2019.

²⁴ World Health Organization. Comprehensive Cervical Cancer Control: A Guide to Essential Practice. 2nd edition. [Report](#).

Goal: Promote shared decision-making and ensure accessible and evidence-based care for cervical cancer.

Objective 1: By 2023, increase the number of board-certified gynecologic oncologists in Indiana.

Data Source	Baseline (2015)	Target
Annual Report – 50 Shades of Teal ²⁵	0.22 per 100,000 people	0.34 per 100,000 people

Strategies –

- Support recruitment efforts and incentives for this specialty area and board certification.
 - Promote Indiana as a provider-friendly state.
 - Encourage sign-on bonuses and higher salaries for gynecologic oncologists.
 - Encourage student loan forgiveness programs for gynecologic oncologists.
 - Encourage potential to earn bonuses for areas such as patient satisfaction or good physician citizenship (ex. serving on committees).²⁶
 - Support mentorship programs for new physicians.
- Increase awareness of the need for board-certified gynecologic oncologists in Indiana.
- Develop a gynecologic oncology fellowship program for obstetrics and gynecology residents.
- Encourage development of state-specific policies to incentivize gynecologic oncology fellowship graduates to work in underserved areas, similar to the National Health Service Corps.²⁷

Objective 2: By 2021, maintain the number of cervical cancer clinical trials available for women in Indiana.

Data Source	Baseline (2018)	Target
Clinicaltrials.gov	6	6

Strategies -

- Identify funding opportunities for cervical cancer clinical trials in Indiana.

²⁵ Ovarian Cancer National Alliance. 50 Shades of Teal: Ovarian Cancer Care across America. [Report.](#)

²⁶ Coker Group - Stanley K (2009) Crafting a Sustainable Model for Physician Recruitment and Retention. [Report.](#)

²⁷ Ricci S et al. (2017) Geographic disparities in the distribution of the U.S. gynecologic oncology workforce: A Society of Gynecologic Oncology study. [Journal Article.](#)

- Identify physician champions within provider networks to promote their clinical research and encourage fellow physicians/researchers to participate in clinical research.²⁸
- Support efforts to disseminate information about clinical trials to potential investigators using established research networks.
- Foster community health partnerships to leverage local resources and communicate research findings to the public to encourage participation in clinical research.

Objective 3: By 2021, increase the percentage of women with cervical cancer participating in clinical trials in Indiana.

Data Source	Baseline (2016-2017)	Target
2016-2017 Behavioral Risk Factor Surveillance System: Cancer Survivorship Module	4.3%	6.6%

Strategies –

- Promote resources to keep providers up-to-date on active and upcoming cervical cancer clinical trials.
- Promote integration of current cervical cancer clinical trials into the electronic medical records to increase physician referral of eligible patients.
- Increase awareness of the clinicaltrials.gov link on public facing websites by monitoring the website for active cervical cancer trials.
- Develop working groups at institutions state-wide to increase enrollment of minority and medically underserved populations in cervical cancer clinical trials.

Objective 4: (Developmental) By 2021, increase the number of women with cervical cancer who are offered palliative/supportive care after diagnosis in Indiana.

Data Source	Baseline (Year)	Target
To be determined	Developmental	Developmental

Strategies –

- Identify a data source to assess the number of cervical cancer patients offered palliative/supportive care services.

²⁸ Miech EJ et al. (2018) Inside help: An integrative review of champions in healthcare-related implementation. [Journal Article.](#)

- Use data on cervical cancer patients offered palliative/supportive care services to determine progress towards set target.
- Work with the Indiana Palliative Care and Quality of Life Advisory Council to develop policy recommendations based on current policy and established best practices.
- Develop and enhance patient-centered navigation systems and pathways based on best practices to ensure optimum care across the continuum of palliative/supportive care for women with cervical cancer.
- Provide educational opportunities to health care professionals to educate providers on the importance of post-treatment care and quality-of-life issues facing cervical cancer survivors.
- Develop and implement educational resources aimed at multiple audiences, such as the public, providers, and healthcare systems, in order to educate and advocate for quality palliative care in Indiana.
- Partner with healthcare systems and employers to identify strategies to increase systematic advance care planning, such as clinician education about how to engage in advance care planning and best practices for eliciting values-based and informed decisions, as well as increasing the accessibility of documentation about patient preferences.
- Improve the quality of life for cervical cancer survivors by providing referrals to rehabilitation services that address unmet physical, social, and emotional needs.
- Work with a variety of stakeholder groups, such as the Family and Social Services Administration, policy makers, nursing groups, healthcare insurers and payers, and others who might contribute to a more well-rounded perspective.
- Increase awareness about healthy living and physical and mental health after a cervical cancer diagnosis through educational and communications campaigns, social media, and publicly available resources.
- Support surveillance systems that increase the use and quality of data.
- Evaluate and review provider, patient, and public usage of educational resources through web and social media impressions and partner promotion and utilization.

Survivorship

Cancer touches us all, whether we have been personally affected or know someone who has. Due to advances in early detection and treatment, more and more people are living after a cancer diagnosis. In Indiana, as of December 31, 2016, there were an estimated 275,439 cancer survivors for all cancers combined and 3,401 cervical cancer survivors.²⁹ A cancer survivor is any person who has been diagnosed with cancer, from the time of diagnosis through the balance of life.³⁰

Improving the quality of life for a cancer survivor means working with the survivor throughout the continuum of cancer. Many survivors experience long-term negative physical, psychosocial, and financial consequences from cancer and have a greater risk for additional cancer diagnoses. Unfortunately, survivors are often lost in transition as they are transferred from a structured system of cancer care to a less structured healthcare system. Cancer survivorship focuses on the health and life of a person beyond the acute phase of diagnosis and treatment. Survivorship aims to both prevent and control adverse outcomes and provide knowledge regarding timely follow-up care, surveillance, and optimizing quality of life after treatment.

Many factors affect a cervical cancer patient's outcome, including stage at and timing of diagnosis, access to optimal treatment and supportive care, overall health, and response to treatment. State of mind is also important. Some women may want to know the exact survival statistics for others who have been diagnosed with their particular stage of cancer. Other women may not want to know. Five-year survival is 92% (local) for the 46% of patients diagnosed with early stage disease, but falls to 57% (regional) and 17% (distant) for women diagnosed with late-stage disease.³¹

Nationally, cervical cancer is most frequently diagnosed in women ages 35 to 44.³² In Indiana, from 2012-2016, 39.2 percent of cases occurred among women ages 44 and under. Since cervical cancer regularly occurs in midlife, which is much earlier than other gynecologic cancers, many women will be cured and have significant life years after treatment completion.³³ Consequently, women can face long-term consequences due to treatment. Women treated for gynecologic cancers have specific therapy-related complications, such as issues with sexual health and gastrointestinal function.³⁴ Women diagnosed with locally advanced cervical cancer undergo a combination of chemotherapy and radiation (chemoRT); these intensive treatments cause significant long-term consequences, and women will lose their fertility and ovarian function.³⁴ Additional concerns among young cervical cancer survivors include fertility preservation and family and work responsibilities.³⁴ Survivorship needs, specific to cervical cancer survivors in Indiana, need to be better understood in order to improve quality of life after treatment.

²⁹ These numbers conservatively reflect the number of survivors who were diagnosed with an invasive cancer between 1995 and 2016. | Indiana State Cancer Registry, Indiana State Department of Health; 2018. [Webpage](#). Accessed on 11/14/2018.

³⁰ American Cancer Society. Cancer Treatment and Survivorship Facts & Figures 2014-2015. [Report](#).

³¹ American Cancer Society. Cancer Facts & Figures 2018. [Report](#).

³² American Cancer Society. Cervical Cancer: Key Statistics. [Webpage](#). Accessed on 9/4/2018.

³³ Duska LR (2017) Overview of approach to cervical cancer survivors. [Journal Article](#).

³⁴ Duska LR et al. (2014) Survivorship in Gynecologic Cancer: Enduring the Treatment toward a New Normal. [Journal Article](#).

Cervical cancer survivors have extremely high smoking rates compared to other cancer survivors.³⁵ One study found that the cervical cancer survivors' smoking rate, 46 percent, was much higher than that of other cancer survivors, such as uterine (29.4 percent), melanoma (13.0 percent), breast (14.1 percent), prostate (5.5 percent) and colon (12.2 percent) cancer.³⁶ Another study, conducted in Kentucky, found that almost half of women diagnosed with cervical cancer (48.6 percent) reported being current smokers and after adjustment for age and stage at diagnosis, cell type, rural residence, race, insurance coverage, and treatment received, current smokers were 35 percent more likely to die of any cause and 21 percent more likely to die of cervical cancer compared with known non-smoking cases.³⁷ In Indiana, during 2016 and 2017, cervical cancer survivors had a smoking rate of 37.2%.³⁸ Smoking cessation interventions should be targeted towards this high-risk group of cervical cancer survivors.³⁹

Currently, little data is available to assess survivorship and quality of life measures among cervical cancer survivors in Indiana. The Indiana Behavioral Risk Factor Surveillance System (BRFSS) collects limited data on cancer survivors in its Cancer Survivorship Module. For the purposes of this report, data from cervical cancer survivors in 2016 and 2017 were combined to have a larger and more representative sample. Cervical cancer survivors were identified among the population, and the data were used to establish baselines and develop targets in this report. In order to further characterize the needs of this population and address this data gap, partners aim to identify data sources that can be used to analyze and assess the current needs of the cervical cancer survivor population in Indiana.

³⁵ Coups EJ and Ostroff JS (2005) A population-based estimate of the prevalence of behavioral risk factors among adults cancer survivors and noncancer controls. [Journal Article.](#)

³⁶ Tseng TS et al. (2012) Who tended to continue smoking after cancer diagnosis: the national health and nutrition examination survey 1999-2008. [Journal Article.](#)

³⁷ Coker AL et al. (2009) Smoking and survival among Kentucky women diagnosed with invasive cervical cancer: 1995-2005. [Journal Article.](#)

³⁸ Data from the IN-BRFSS Cancer Survivorship Module 2016 and 2017

³⁹ Mayer DK and Carlson J (2011) Smoking Patterns in Cancer Survivors. [Journal Article.](#)

Goal: Improve quality of life for all those affected by cervical cancer.

Objective 1: By 2021, decrease the percentage of cervical cancer survivors in Indiana who report being current smokers.

Data Source	Baseline (2016-2017)	Target
2016-2017 BRFSS: Cancer Survivorship Module	37.2%	14.5%

Strategies -

- Increase the dissemination and utilization of survivorship care plans that include information about healthy lifestyle behaviors, including tobacco cessation programs.
- Work with healthcare provider groups and health systems to integrate referral to the Indiana Tobacco Quitline into electronic health record systems.
- Educate health professionals in local medical communities through grand rounds, tumor board meetings, continuing education trainings, and other venues about healthy lifestyle behaviors for cervical cancer survivors in order to reduce their risk of cancer recurrence and new cancers (and symptoms from disease and treatment).
- Establish educational forums for patients on survivorship in partnership with professional organizations.
- Establish educational forums for providers on survivorship in partnership with professional organizations.
- Promote the concept of survivorship as a chronic condition that people can live with and manage with healthy lifestyle behaviors, including quitting smoking.
- Promote tobacco cessation among cervical cancer survivors as a means to improve health.

Appendices – All

- a. [HPV Vaccine: Facts and Fears](#)
- b. Strategic Plan Kickoff Agenda, List of Speakers, and List of Participants
- c. Methods for Estimating Cervical Cancer Healthcare Costs in Indiana
- d. [Indiana Cancer Consortium](#)
- e. [Indiana Cancer Control Plan](#)
- f. [Indiana Cancer Facts & Figures](#)
- g. [Indiana Immunization Coalition](#)
- h. [Indiana Tobacco Quitline](#)
- i. [Indiana State Cancer Registry Statistical Report Generator](#)
- j. [Indiana Behavioral Risk Factor Surveillance System](#)
- k. [Indiana INDicators](#)
- l. [ICC Cervical Cancer Toolkit](#)
- m. [HPV: Don't Wait. Vaccinate! A Shot at Cancer Prevention Toolkit](#)
- n. [Quit Now Indiana](#)
- o. [Kristen Forbes EVE Foundation](#)
- p. [Cervical Cancer-Free Coalition](#)
- q. [Cervivor](#)
- r. [American Cancer Society](#)
 - i. [HPV Information](#)
 - ii. [National HPV Vaccination Roundtable](#)
 - iii. [National HPV Vaccination Roundtable Resource Library](#)
- s. [HPV Vaccination Resource Clearinghouse](#)
- t. [President's Cancer Panel HPV Vaccination for Cancer Prevention](#)
- u. [CDC](#)
- v. [United States Preventive Services Task Force](#)
- w. [Vaccines for Children](#)
- x. [National Immunization Surveys](#)
- y. [Children and Hoosier Immunization Registry Program](#)
- z. [Indiana Breast and Cervical Cancer Program](#)

Appendix B.



Cervical Cancer Strategic Planning Kickoff Agenda

September 26, 2017
9 a.m. to 4 p.m.

American Cancer Society

5635 W. 96th Street, Suite 100, Indianapolis, IN 46278

AGENDA

8:30 a.m. Registration

9 a.m. Welcome and Introductions

Rep. Sharon Negele

9:30 a.m. Cervical Cancer in Indiana – Current State and Best Practices

- Overview
- Primary Prevention
- Early Detection
- Treatment
- Survivorship

Noon Working Lunch – Goal, Focus Areas, and Objectives

Lisa Osterman, Community Solutions, Inc.

12:45 p.m. Breakout Sessions

2:15 p.m. Break

2:30 p.m. Report Out

4 p.m. Next Steps and Closing

I. Welcome and Purpose

Keylee Wright, Director of the Cancer Control Section at the Indiana State Department of Health (ISDH), welcomed the participants and thanked them for coming to the Cervical Cancer Strategic Planning Kickoff Meeting. The purpose of the meeting is to **begin to develop a plan to reduce morbidity and mortality of cervical cancer in Indiana.**

Keylee recognized Lisa Robertson of the Indiana Immunization Coalition and Katie Crawford of the American Cancer Society for their support in making the day possible. She also thanked the internal ISDH workgroup partners and the subject matter experts presenting at the meeting, who include:

- Jane Berby-Todd, *St. Vincent Cancer Care*
- Dr. Sarah Bosslet, *Witham Health Services*
- Kaila Brooks, *North Central Nursing Clinics—Purdue University*
- Melissa Cervantes, *Indiana State Department of Health*
- Julie Langston, *North Central Nursing Clinics—Purdue University*
- Dave McCormick, *Indiana State Department of Health*
- Rep. Sharon Negele, *Indiana House of Representatives*
- Laura Ruppert, *Indiana State Department of Health*
- Heather Sager, *Indiana State Department of Health*
- Claudine Samanic, *Indiana State Department of Health*
- Dr. Jeanne Schilder, *Indiana University School of Medicine*
- Erica Frazier Stum, *Cervivor*

Keylee then introduced the staff from Community Solutions, Inc., an Indianapolis-based consulting company with a great deal of experience in public health planning. Community Solutions also serves as the external evaluation partner for the Cancer Control Section of the ISDH. Community Solutions staff – Cynthia Cunningham, Helen Jesse, Kaley Martin, and Lisa Osterman – were responsible for facilitating and documenting the meeting.

Meeting Participants

First Name	Last Name	Affiliation
Ann	Alley	ISDH
Jane	Berby-Todd	St. Vincent Cancer Care
Sarah	Bosslet	Witham Health Services/ American Academy of Pediatrics
Kaila	Brooks	North Central Nursing Clinics—Purdue University
Melissa	Cervantes	ISDH
Rishika	Chauhan	Indiana Cancer Consortium
Lauren	Clark	ISDH
Katie	Crawford	American Cancer Society
Julia	Engstrom-Melnyk	Roche Diagnostics Corporation
Brenda	Forbes	Kristen Forbes EVE Foundation
Erica	Frazier Stum	Cervivor
Mugdha	Golwalkar	ISDH
Antoinette	Holt	ISDH
Julie	Langston	North Central Nursing Clinics—Purdue University
Art	Logsdon	ISDH
Dave	McCormick	ISDH
Paige	McDaniel	Indiana State Nurses Association
Sharon	Negele	Indiana House of Representatives
Litany	Pyle	Indiana House of Representatives
Timothy	Ratliff	Purdue Center for Cancer Research
Lisa	Robertson	Indiana Immunization Coalition
Katelin	Rupp	ISDH
Laura	Ruppert	ISDH
Heather	Sager	ISDH
Claudine	Samanic	ISDH
Jeanne	Schilder	Indiana University School of Medicine, Simon Cancer Center
Rivienne	Shedd-Steele	Indiana University School of Medicine, Simon Cancer Center
Sarah	Strawbridge	Merck/US Policy and Government Relations
Brownsyne	Tucker Edmonds	Indiana University School of Medicine
Stephanie	VanderHorst	Indiana Auburn Birthing Center
Keylee	Wright	ISDH
Gregory	Zimet	Indiana University School of Medicine

Appendix C.

**Methods for Estimating
Cervical Cancer
Healthcare Costs in
Indiana
October 2018**

Cynthia Lewis, MPH
Terrell Zollinger, DrPH
Cynthia K Lewis & Associates, LLC

Acknowledgements

The authors would like to thank Hollie Kicinski, MPH, Epidemiology Data Analyst at the Epidemiology Resource Center, Indiana State Department of Health, who provided a number of the statistics needed for this report.

This publication was supported by state fund 44305, Breast and Cervical Cancer Program, funded by the Indiana State Department of Health. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Indiana State Department of Health or the State of Indiana.

Methods

The direct health care costs for cervical cancer in Indiana were estimated using the most recent data available from national sources. Estimated costs included hospital inpatient costs, physician office visit costs, and medication costs for individuals treated for care. Data sources included the National Ambulatory Medical Care Survey (NAMCS), Medical Expenditure Panel Survey Household Component (MEPSHC), National Cancer Institute (NCI), Indiana State Department of Health, and the U.S. Census. Before applying the costs per case estimates to the number of events, the costs were adjusted to 2017 dollars, using the medical care category of the consumer price indices established by the U.S. Department of Labor.¹

Direct costs for cervical cancer were estimated separately for all cervical cancer cases receiving care in Indiana and for those cases attributed to HPV exposure. The below formulas include attributable risk (AR); however, the AR value was only applied to the costs estimated for HPV exposure as shown in Table 2. The direct healthcare costs for all Indiana cervical cancer cases receiving care are shown in Table 1.

Indiana Hospitalization Discharges

The number of hospital discharges (2017) and charges (2017) for cervical cancer were obtained directly from annual hospital discharge summaries prepared by the Indiana Hospital Association and provided to the Indiana State Department of Health. Note that the formulas use “CH” to indicate the cost of care because the value provided is actually “charges” associated with the care, rather than actual costs of providing the care. The text uses the term “costs” since this is a term that the general public associates with economic impact; however, it is the charges for the care that was actually provided.

The formula used to calculate the hospitalization costs was:

$$\text{Hospitalization Costs} = H * AR * CH$$

Where:

H is the number of hospitalizations in Indiana for cervical cancer (2017);

AR is the estimated attributable risk of getting the disease if HPV (Table 2 only); and,

CH is the average charge per hospitalization for cervical cancer in 2017.

Indiana Physician Office Visits

To obtain the number of Indiana physician office visits for those with cervical cancer, the following formula was used:

Physician office visits for cervical cancer (EPO) = TIO * PCV * CCT

Where:

TIO = Total Indiana physician office visits from NAMCS (2015)²,

PCV = Percent of U.S. physician office visits with cancer as primary diagnosis from NAMCS (2015)² and,

CCT = The proportion of cervical cancer from all U.S. cancers from NCI (2015).³

Estimating costs of Physician Office Visits

Once the number of physician office visit events were determined, then the costs of that care could be estimated. The formula used to calculate the cost was:

Physician Office Visit Costs (EPOC) = EPO * AR * CH

Where:

EPO is the estimated number physician office visits in Indiana for cervical cancer,

AR is the attributable risk of getting the disease if exposed to HPV (Table 2 only)

and,

CH is the mean annual charge per visit for cancer from MEPSHC (2014)⁴

The total annual prescribed medication costs per person for cervical cancer included in this calculation applied the annual cost of prescription medications for cancer to the estimated prevalence of cervical cancer in Indiana. The formula used to calculate the mean annual medication costs for cervical cancer:

Medication Costs = INDN * AR * CH

Where:

INDN = Estimated number of cervical cancer cases in Indiana from the product of cervical cancer prevalence rate (NCI 2015)³ and U.S. Census count of the Indiana female population (2017)

AR is the attributable risk of getting the disease if exposed to HPV, and

CH is the mean annual charges for medication per individual for cancer from MEPSHC (2014).⁴

Limitations in Estimating Direct Medical Costs

The major limitations that affect the validity of the estimated direct healthcare costs relate to data gaps and underlying assumptions. First, since the cervical cancer prevalence and the annual mean costs of physician visits and medication costs directly related to cervical cancer for Indiana were not available, the estimates used in this study were based on cervical cancer prevalence rates and costs for the U.S. Second, this model assumed that the percent of costs attributed to treatment of the cervical cancer is the same as for all types of cancer.

Mortality Costs (Indirect Costs) of Cervical Cancer

Mortality costs for cervical cancer were estimated using the Present Value of Lifetime Earnings (PVLE) method and the Value of a Statistical Life (VSL) method. A study from California⁵, which applied the PVLE method to estimate mortality costs associated with cervical cancer, was used to derive the cost per death associated with cervical cancer in Indiana.

“The estimated mortality costs are the product of the number of deaths and the expected value of a female individual’s future earnings with age taken into account. This method of derivation considers life expectancy for different age groups, the changing pattern of earnings at successive age groups, the changing pattern of earnings at successive ages varying labor force participation rates, an imputed value for housekeeping services, and a discount rate of 3% to convert the stream of lifetime earnings into a present value equivalent. An average annual increase of 1% in the future productivity of wage earners was assumed.”⁵

The formula for calculating PVLE is as follows⁶:

$$PVLE_{y,g} = \sum_{n=y}^{85+} P_{y,g}(n) [Y_g(n)E_g(n) + Y^h_g(n)E^h_g(n)] * (1+p)^{n-y} / (1+r)^{n-y} \tag{1}$$

Where $PVLE_{y,g}$ is the present discounted value of lifetime earnings for a person of age y and gender g

$P_{y,g}(n)$ is the probability that a person of age y and gender g will survive to age n

y is the age of the person at present

g is the gender of the individual

n is the age of the person

$Y_g(n)$ is the mean annual earnings of an employed person of gender g and age n

$E_g(n)$ is the proportion of the population of gender g and age n that are employed

in the labor market

$Y_g^h(n)$ is the mean annual imputed value of household production for a person of gender g and age n

$E_g^h(n)$ is the proportion of the population of gender g and age n that are keeping house

p is the rate of increase of labor productivity

r is the real discount rate

Data were not accessible to calculate the per death cost for cervical cancer in Indiana using the PVLE formula. Therefore, the per death estimate for California in 1998 (~\$351,000) was adjusted to 2017 dollars using the consumer price index.

A study from Indiana⁷, which applied the VSL method, was also used to estimate the cost per death associated cervical cancer. The mortality cost for cervical cancer was calculated using the following formula.

$$\text{Loss of Life Costs} = \text{AR} * \text{D} * \text{VSL} * [(\text{LE} - \text{AD})/\text{LE}]$$

Where:

AR is the attributable risk due to HPV exposure (Table 2 only);

D is the number of deaths in Indiana in 2017 for cervical cancer;

VSL is the estimated statistical value of a full life (estimated at \$9,900,000 for 2017);

LE is the female life expectancy of 81.1 years (2017); and,

AD is the average age of death in 2017 for cervical cancer for those who died before their life expectancy.

The term $[(\text{LE} - \text{AD})/\text{LE}]$ estimates the proportion of a person's life that is lost due to premature death.

The information needed to calculate these costs included: the attributable risk for HPV (Table 2 only), the number of deaths for cervical cancer (based on provisional 2017 mortality data set prepared by the Indiana State Department of Health Data Analysis Team on September 13, 2018), an estimate of the value of life, female life expectancy (81.1 years as reported by the National Center for Health Statistics⁸ based on 2016 deaths) and the average age at death for cervical cancer in 2017 as reported by the Indiana Hospital Association to the Indiana State Department of Health. The same AR values were used for the loss of life estimates as for the costs of hospitalization.

To determine the loss of life costs, the estimated Value of a Statistical Life (VSL) of \$9.9 million in 2017 was obtained from the United States Department of Transportation.⁹ The mean age at death for those who died before they reached life expectancy for cervical cancer was subtracted from the average U.S. life expectancy of 81.1 years for 2016⁸ divided by this average life expectancy (81.1 years) to determine the percent of years of life lost. This percent of years of life lost was multiplied by the value of life estimate and then multiplied by the number cervical cancer deaths to obtain an estimated dollar value for the loss of life.

Advantages and Limitations in Estimating Adult Mortality Costs

There are advantages and limitations related to estimating of the costs of adult mortality using each method. The PVLE method is a valid method for illustrating the potential benefits of prevention efforts since it estimates the downstream mortality cost for a lost life¹⁰. It also factors in differences in workforce participation and mean wages by age and gender. However, the per death cost derived from the California study (PVLE method) is based on old data and makes assumptions that may not be true. It assumes the following:

- 1) Female life expectancy has not changed since 1998
- 2) Mean annual wages in Indiana are the same as California
- 3) The proportion of women in the labor force is the same for Indiana and California has remained constant since 1998
- 4) The mean annual imputed value of household production has remained constant since 1998
- 5) The proportion of women keeping house is the same for Indiana and California and has remained constant since 1998
- 7) Treatment for cervical cancer has not improved enough to reduce the number of years of life lost

The Indiana study (VSL method) uses more recent data and is used by the Department of Transportation in assessing the benefits of preventing fatalities⁷. It is not viewed as the value of a life, but the valuation of risk reduction⁷. It not only includes lost income, lost productivity, and additional expenses of obtaining household services normally provided by women, but also pain and suffering and loss of companionship. The PVLE method does not include pain and suffering and loss of companionship. Unlike the PVLE method, the VSL estimate assumes a constant value for each life regardless of age, gender, or mean wages.

Although placing a value on a human life can be controversial, using a value of life method as a measure of indirect costs related to premature death for cervical cancer is supported by the literature. Even if more recent data were obtained to use the PVLE method, it would still likely yield a much more conservative estimate than the VSL method. Regardless of the indirect cost estimate chosen, it is important to note the limitations of each method.

References

1. National Bureau of Labor Statistics, http://data.bls.gov/timeseries/CUUR0000SAM?output_view=pct_12mths, accessed September 2, 2018.
2. Centers for Disease Control and Prevention. National Center for Health Statistics. National Ambulatory Medical Care Survey: 2015 State and National Summary Tables, https://www.cdc.gov/nchs/data/ahcd/namcs_summary/2015_namcs_web_tables.pdf accessed September 12, 2018.
3. Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov). Prevalence database: "US Estimated Complete Prevalence Counts on 1/1/2015". National Cancer Institute, DCCPS, Surveillance Research Program, Data Modeling Branch, released April 2018, based on the November 2017 SEER data submission. <https://surveillance.cancer.gov/prevalence/canques.html>
4. Agency for Healthcare Research and Quality. Mean Expenses per Person with Care for Selected Conditions by Type of Service: United States, 2014. Medical Expenditure Panel Survey Household Component Data. https://meps.ahrq.gov/mepsweb/data_stats/tables_compendia_hh_interactive.jsp?SERVICE=MEPSSocket0&PROGRAM=MEPSPGM.TC.SAS&File=HCFY2014&Table=HCFY2014_CNDXP_CA&Debug=Generated Generated interactively October 5, 2018.
5. Max, W, Rice DP, Sung H, Michel M, Breuer W, Zhang X. The economic burden of gynecologic cancers in California, 1998. *Gynecologic Oncology*, 2003, Volume 88, Issue 2: 96-103.
6. Max, W, Rice DP, Sung H, Michel M. Valuing human life: Estimating the present value of lifetime earnings, 2000. US San Francisco. Economic Studies Related Methods. 2004.
7. Lewis CK, Zollinger TW. Estimating the economic impact of secondhand smoke exposure in Indiana 2014. Prepared for the Indiana Tobacco Prevention and Cessation Commission, Indiana State Department of Health, April 2016.
8. Xu JQ, Murphy SL, Kochanek KD, Bastian B, & Arias E. Deaths: Final data for 2016. National vital statistics reports; vol 67 no 5. Hyattsville, MD: National Center for Health Statistics. 2018, accessed September 20, 2018.
9. U.S. Department of Transportation. Office of the Secretary of Transportation. <https://cms.dot.gov/sites/dot.gov/files/docs/2016%20Revised%20Value%20of%20a%20Statistical%20Life%20Guide.pdf> accessed October 1, 2018.
10. Insigna, RP. Annual productivity costs due to cervical cancer mortality in the United States. *Women's Health Issues*, 2006, 16, 236-242.

Direct and Mortality (Indirect) Costs Tables

Direct Medical Costs Related to Cervical Cancer Indiana, 2017				
Incidence*	Type of Care Received	# of Hospitalization, Outpatient/ Office Visit, and Medications	Cost Per Hospitalization, Outpatient/ Office Visit, and Medications (2017 Dollars)	Total Cost (2017 Dollars)
142	Hospitalizations ¹	142	\$59,602	\$8,463,434
9640	Outpatient/Office Visits	9640	\$3,461	\$33,364,040
5318	Medications	5318	\$2,408	\$12,807,127

Total Annual Inpatient Hospitalization Costs = \$8,463,434

Total Annual Outpatient/Provider Based Office Visits Costs = \$33,364,040

Total Annual Medication Costs = \$12,807,127

Estimated - Total Annual Direct Healthcare Cost = **\$54,634,601**

Mortality Costs (Indirect Costs) Related to Cervical Cancer Indiana, 2017				
Method	# of Deaths	Mean Age of death	Cost Per Death (2017 Dollars)	Total Cost (2017 Dollars)
VSL	105	55.2	\$3,161,652	\$331,973,460
PVLE	105	n/a	\$549,898	\$57,739,290

Estimated Total Mortality Costs (Indirect Costs) (VSL Method) = **\$331,973,460**

Estimated Total Mortality Costs (Indirect Costs) (PVLE Method) = **\$57,739,290**

1. Indiana State Department of Health, Epidemiology Resource Center, Data Analysis Team from data supplied by the Indiana Hospital Association (2017 Discharges)

2. Indiana State Department of Health, Epidemiology Resource Center, Data Analysis Team. Death data reflects the provisional 2017 mortality data set prepared by the Indiana State Department of Health Data Analysis Team on September 13, 2018.

*Incidence numbers based on Indiana hospital discharge data and calculations derived from national data sources calculations explained in methods text.

Direct Medical Costs Related of Cervical Cancer Attributed to HPV Exposure					
Indiana, 2017					
Incidence*	Type of Care Received	Attributable Risk**	# of Hospitalization, Outpatient/ Office Visit, and Medications	Cost Per Hospitalization, Outpatient/ Office Visit, and Medications (2017 Dollars)	Total Cost Attributable to HPV Exposure (2017 Dollars)
142	Hospitalizations ¹	91.0%	129	\$59,602	\$7,701,725
9640	Outpatient/Office Visits	91.0%	8772	\$3,461	\$30,361,276
5318	Medications	91.0%	4839	\$2,408	\$11,654,485

Total Annual Inpatient Hospitalization Costs = \$7,701,725

Total Annual Outpatient/Provider Based Office Visits Costs = \$30,361,276

Total Annual Medication Costs = \$11,654,485

Estimated - Total Annual Direct Healthcare Cost = **\$49,717,487**

Mortality Costs (Indirect Costs) Related to Cervical Cancer Attributed to HPV Exposure					
Indiana, 2017					
Method	Attributable Risk**	# of Deaths Attributed to HPV Exposure	Mean Age of death	Cost Per Death (2017 Dollars)	Total Cost (2017 Dollars)
VSL	91.0%	96	55.2	\$3,129,716	\$300,452,774
PVLE	91.0%	96	n/a	\$549,898	\$52,790,208

Estimated Total Mortality Costs (Indirect Costs) (VSL Method) = **\$300,452,774**

Estimated Total Mortality Costs (Indirect Costs) (PVLE Method) = **\$52,790,208**

1. Indiana State Department of Health, Epidemiology Resource Center, Data Analysis Team from data supplied by the Indiana Hospital Association (2017 Discharges).

2. Indiana State Department of Health, Epidemiology Resource Center, Data Analysis Team. Death data reflects the provisional 2017 mortality data set prepared by the Indiana State Department of Health Data Analysis Team on September 13, 2018.

*Incidence numbers based on Indiana hospital discharge data and calculations derived from national data sources calculations explained in methods text.

**Attributable risk values from published data.